# For Lung Transplant, Researchers Surprised To Learn Bigger Appears To Be Better

Transplant teams have long tried to match the size of donor lungs to the size of the recipient as closely as possible, concerned that lungs of the wrong size could lead to poor lung function and poor outcomes. But new Johns Hopkins-led research suggests that oversized donor lungs may instead be the best option for patients, finding they are associated with a 30 percent increased chance of survival one year after the operation.

The issue of lung size was brought into the spotlight recently with the case of a 10-year-old Pennsylvania girl in need of a lung transplant. Regulations have made children under the age of 12 ineligible to receive adult lungs, primarily because of the potential size mismatch. Her situation sparked a national debate on organ allocation procedures, and her family successfully petitioned the courts to enable her to receive lungs from an adult.

"Despite what we thought, bigger lungs turn out to be better," says Christian A. Merlo, M.D., M.P.H., a lung transplant expert at the Johns Hopkins University School of Medicine and senior author of a study published in the August issue of the *The Annals of Thoracic Surgery*. "The survival rates for lung transplant, unfortunately, are not as good as with other solid organ transplants like liver, kidney and heart. But our study tells us that if we were to routinely transplant larger lungs into patients, we could potentially make a real impact on survival. And that's the goal of research."

Lung size can be estimated from the height and sex of the patients and is termed the "predicted total lung capacity." Taller people have bigger lungs and a man's lungs are larger than a woman's of the same height. The researchers defined lung size mismatch as the ratio of the predicted lung capacity of the donor relative to the recipient. For example, a ratio of 1.0 is a perfect size match, whereas a ratio of 1.3 indicates that the transplanted lung is significantly larger than the predicted total lung capacity for the recipient. Merlo's research found that double lung transplant recipients who received lungs with an average ratio of 1.3 were 30 percent less likely to die in the first year.

The research, led by Michael Eberlein, M.D., Ph.D., a former Johns Hopkins medical resident and fellow, was done by analyzing data from 4,520 double lung transplants and 2,477 single lung transplants performed between May 2005 and April 2010 in the United States. The findings were clearer about the benefits of larger lungs in double lung transplants than in single ones, though oversized lungs did convey some survival benefit in those cases as well, they found.

"Size is a more powerful predictor of survival than we ever thought," says Ashish S. Shah, M.D., surgical director of lung transplantation at The Johns Hopkins Hospital

and another of the study's authors. "Fears of oversized lungs appear to be unfounded. We hope this research dispels some myths."

In lung transplant, the sickest patients move to the top of the list. Once an adult patient is atop the list, height and gender (along with blood type) are used to determine whether those lungs are suitable for that patient. Merlo and Shah say it might be better to build in a calculation for predicted lung capacity. That way, oversized lungs could be offered to patients instead of smaller lungs that may not work as well.

Lungs can be too large, they caution. If lungs are beyond a certain size, surgeons could have trouble closing the chest cavity, the lungs could be too compressed and collapse or could weigh too heavily on the heart, causing low blood pressure and other problems.

Currently, children under 12 cannot receive adult lungs and adults cannot receive lungs from pediatric donors. Shah, an associate professor of surgery at Johns Hopkins, says the findings suggest that there may be some benefit to removing age from the equation altogether when allocating lungs, putting children and adult donors and recipients into the same pool. Then, doctors could make decisions based on each individual case and the size of the donor organs that become available.

"This study tells us that rather than looking at things like age or height, you have to look at each patient very carefully and determine what their lung capacity is," Shah says. "There may be children who could take adult lungs that would be oversized for them with a good result. And there may be small adults who would do well with pediatric lungs."

Still, Shah points out, while larger lungs may be ideal, transplant candidates who don't get new organs are more likely to die, so smaller lungs are often better than none at all. There are currently more than 1,600 people listed for lung transplants in the United States and many die before getting new lungs. One-year survival after lung transplantation is 80 percent.

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